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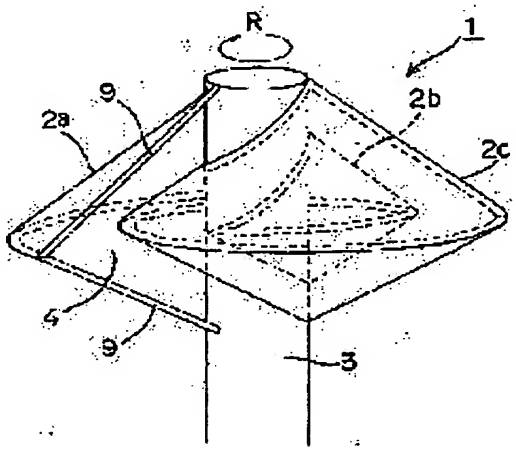
(71)Applicant : DAIEI DREAM KK
(72)Inventor : NAGASHIMA AKIRA

(54) WINDMILL

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a drag type windmill capable of extremely efficiently providing general energy without spoiling advantages such as rotating performance under weak wind, high torque in a low-speed rotating area, quiet and structural simplicity in rotating.
SOLUTION: This windmill 1 is formed by attaching multiple vanes 2 formed of first blades 5 and second blades 6 about a rotary shaft 3 and each of the first and the second blades 5 and 6 is provided with a joining end edge 8, a spiral end edge 7, and an opening end edge 9. The vane 2 is formed by joining the first blade 5 and the second blade 6 at respective joining end edges 8, and respective spiral end edges 7 and 7 of the first and the second blades 5 and 6 are fixed onto the rotary shaft 3 so that the vane 2 is fitted to the rotary shaft 3. This windmill is also characterized in that an opening part 4 for receiving the wind is formed of opening part end edges 9 of the first and the second blades 5 and 6.



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[Claim(s)]

[Claim 1] It is the wind mill which comes to have attached in the circumference of a revolving shaft two or more sets of wings formed of the 1st blade and 2nd blade. Said 1st and 2nd blades It has the edge for junction, the spiral edge, and the edge for openings, respectively. Said wing By coming to join the 1st blade and 2nd blade in each edge for junction, and fixing each spiral edge of said 1st and 2nd blades on said revolving shaft The wind mill characterized by forming opening attaching said wing in a revolving shaft and receiving a wind by the edge for openings of said 1st and 2nd blades.

[Claim 2] The wind mill according to claim 1 with which the front face of said 1st blade and/or said 2nd blade is characterized by forming the tangent surface.

[Claim 3] The wind mill with which the front face of the cloth material which is the wind mill which two-or-more-picking-comes to attach to the circumference of a revolving shaft the wing formed by stretching cloth material on a frame, and was stretched by said frame is characterized by forming the tangent surface.

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the wind mill of the reaction mold which has the wing of a rational configuration formed using the "tangent surface" which can be especially defined on geometry about the wind mill which can be used as sources of power, such as a wind power facility and a pumping facility.

[0002]

[Description of the Prior Art] A wind mill rotates body of revolution using the force of a wind, and obtains kinetic energy, namely, it is equipment which transforms natural energy called a wind force into rotational energy available as sources of power, such as a machine, and if it divides roughly, it can classify it into the lift mold wind mill which makes a propeller mold the start, and a reaction mold wind mill.

[0003] Since the conversion efficiency of energy is excellent, the wind mill of a propeller mold is a wind mill of the mold which has spread most widely in a wind power station etc. Since kinetic energy can be

especially obtained efficiently under a strong wind, it is used in the location which it is stabilized and a strong wind mainly blows.

[0004] Drawing 10 shows briefly the structure of the common propeller mold wind mill 100. In addition, in this drawing, 101 is the revolving shaft with which a propeller and 102 were held horizontally.

[0005] A propeller 101 needs to hold a propeller 101 to sense sense and surface of revolution always cross at right angles to a wind, in order to obtain rotational kinetic energy most efficiently in the wind mill of such a propeller mold although it will rotate to the circumference of a revolving shaft 102 if the force of a wind is received. Therefore, the device (directional-control device) in which the sense of a propeller 101 can be made to change according to change of a wind is usually prepared in this kind of propeller mold wind mill 100.

[0006] On the other hand, the wind mill of a reaction mold rotates good under a breeze, and since a peripheral-speed ratio does not exceed 1 except that it has the advantage that high torque (turning effort) can be generated in a low-speed revolution region, it excels in the safety and silence over a strong wind. Moreover, since the wind from all can be used, the directional-control device which is easy to cause failure is not needed, the structure of a wind mill can be simplified, consequently a maintenance is very easy, and it excels in profitability. Therefore, the wind mill of a reaction mold is used for a homely and small-scale pumping facility, a generation-of-electrical-energy facility, etc. in a developing country or the weak area of a wind.

[0007] Drawing 11 shows briefly the general structure of the slowdown NIUSU mold wind mill 200 as a wind mill of a reaction mold. This slowdown NIUSU mold wind mill 200 is constituted by the revolving shaft 207 held at the abbreviation perpendicular, and the wing 201,202 of a curved-surface configuration by which a cross section serves as radii as illustrated.

[0008] A wing rotates the wind mill of this kind of reaction mold to the circumference of a revolving shaft according to "the difference of reaction (air resistance)" which produces a wind from an one direction between each wing in a carrier beam case.

[0009] When a wind blows from a near side to the slowdown NIUSU mold wind mill 200 in drawing 11 (in namely, the direction of an arrow head

K), it more specifically sets at the wing 201 of the left-hand side in drawing. Although the force which a wind will be received in the opening 201a side, and the force which it is going to rotate towards the drawing Nakaya mark J1 will act, and is going to receive a wind in the tooth-back section 202b side in the wing 202 by the side of drawing Nakamigi on the other hand, and it is going to rotate towards the drawing Nakaya mark J2 will act Since the validity as opposed to a wind in the direction of the opening 201a side is larger than the tooth-back section 202b side, a wing 201,202 will rotate in the direction of an arrow head J1 after all.

[0010]

[Problem(s) to be Solved by the Invention] The wind mill of a propeller mold can change energy into the bottom of a strong wind efficiently, as mentioned above, but since conversion efficiency falls to the bottom of a breeze, there is a problem that it cannot use if it is not the area (place when an annual mean wind specifically exceeds a second in 5m /) which the strong wind is stabilizing for which and blowing.

[0011] Moreover, it is not suitable for the utilization in an accommodation space etc. from a viewpoint of safety, either, except that the noise by the whizzing sound may pose a problem, when the rotational speed of a wind mill becomes large. Furthermore, since a directional-control device, the safety device made to suspend operation of a wind mill when a regular wind speed is exceeded are needed, structure becomes complicated and there is a problem in points, such as a manufacturing cost and the ease of administrative and maintenance expense and a maintenance.

[0012] On the other hand, the slowdown NIUSU mold wind mill 200 as shown in drawing 11 has the fault that the conversion efficiency of energy is not not much high, compared with the wind mill of a propeller mold. Moreover, although the various designs of the slowdown NIUSU mold wind mill which added amelioration, such as what put the twist into the wing, are carried out in order to lose the dead point of what accumulated the increase of number of sheets and the thing carried out of a wing, and the wing up and down in order to cancel such a fault, and was made into the multistage type, and torque Although each of these can expect improvement in some engine performance, "the simplicity of structure"

which is the original advantage of a reaction mold wind mill will be lost.

[0013] Moreover, if the configuration by the side of the tooth-back section can be constituted in a slowdown NIUSU mold wind mill so that the reaction to a wind may become as small as possible, since it will become possible to make it rotate so smoothly Although the front face of the tooth-back section is formed in the shape of a curved surface in many cases, plate-like ingredients, such as plywood and a metal plate, are processed, and a curved surface is formed, for example (aerodynamic characteristics etc. are especially taken into consideration). What the curved surface designed by the basis of rational and precise count is faithfully formed for based on a design value is accompanied by difficulty in many cases.

[0014] It processes a plate-like ingredient, and in order to form the curved surface describing a delicate curve, the routing counter of an activity not only increases, but it is necessary to manufacture a "mold" beforehand and, more specifically, a manufacturing cost will increase.

[0015] In spite of being able to manufacture simplicity and economically, without making this invention that such a problem should be solved and using a "mold" in the wind mill of a reaction mold Have the wing which presents a rational and delicate curved-surface configuration, and the wind mill of a reaction mold had from the former. It aims at offering the wind mill of the reaction mold which can obtain the high rotational energy of versatility efficiently, without spoiling advantages, such as rotationality under a breeze, high torque in a low-speed revolution region, silence at the time of a revolution, and the simplicity of structure.

[0016]

[Means for Solving the Problem] The wind mill concerning this invention is a thing which two-or-more-picking-comes to attach to the circumference of a revolving shaft the wing formed of the 1st blade and 2nd blade. The 1st and 2nd blades It has the edge for junction, the spiral edge, and the edge for openings, respectively. Said wing By coming to join the 1st blade and 2nd blade in each edge for junction, and fixing each spiral edge of said 1st and 2nd blades on said revolving shaft It is characterized by attaching said wing in a revolving shaft and forming

opening for the edge for openings of said 1st and 2nd blades receiving a wind further.

[0017] In addition, when the front face of said 1st blade and/or said 2nd blade constitutes so that a tangent surface may be formed, the wing of a rational configuration can be manufactured simplicity and economically using a plate-like member, without needing a "mold."

[0018] Moreover, by attaching to the circumference of a revolving shaft the wing formed by stretching cloth material on a frame instead of said blade two or more picking, the wind mill concerning this invention can also be constituted and structure can be made simple in this case.

[0019]

[Embodiment of the Invention] Hereafter, the operation gestalt of the wind mill concerning this invention is explained, referring to a drawing. Drawing 1 is the perspective view of the wind mill 1 in the 1st operation gestalt of this invention, and drawing 2 is the top view. This wind mill 1 is fundamentally constituted by three wing 2a and 2bs, 2c, and the revolving shaft 3 as shown in these drawings.

[0020] three wings 2a-2c are illustrated -- as -- the circumference of a revolving shaft 3 -- all -- the same direction -- and each keeps equal spacing and is arranged. And if a wind is received from a certain direction, this wind mill 1 will receive a wind in the opening 4 of any one wing 2, and will rotate according to the force of this wind in the specific direction (drawing 1 and the direction of R in drawing 2).

[0021] Drawing 3 is the perspective view of the wing 2 used for the wind mill 1 shown in drawing 1 and drawing 2 , and drawing 4 is the top view. This wing 2 is constituted by the 1st blade 5 and 2nd blade 6 so that clearly also from drawing 3 . Moreover, all, the 1st blade 5 and 2nd blade 6 have the spiral edge 7, the edge 8 for junction, and the edge 9 for openings, respectively, and are constituted by the curved surface 10 which makes these a perimeter [outside] line.

[0022] The 1st blade 5 and 2nd blade 6 serve as a configuration mutually ****ed on the basis of the level surface, and constitute the wing 2 by joining each edge 8 for junction, and eight comrades. And the wing 2 is attached in the revolving shaft 3 by fixing the spiral edges 7 and 7 shown in drawing 3 on the peripheral face of the revolving shaft 3 shown in drawing 1 and drawing 2 .

[0023] Moreover, the opening 4 for receiving a wind will be formed in the circumference of a revolving shaft 3 of the edges 9 and 9 (and some revolving shafts 3) for openings of a wing 2 by doing in this way and attaching a wing 2 in a revolving shaft 3.

[0024] In addition, the curved surface 10 which constitutes the 1st blade 5 and 2nd blade 6, respectively is constituted so that a "tangent surface" may be formed. This "tangent surface" is one of the curved surfaces which can be defined on geometry, and since it is important especially when you understand the structure of the wing 2 in this operation gestalt, it explains in detail below.

[0025] A tangent surface is a curved surface constituted considering the helix C1 shown in drawing 5 , a straight line C2, and the involute curve C3 as a perimeter [outside] line. Among these lines, a helix C1 is a segment which exists on the peripheral face of the cylinder S with which a diameter is set to d1 and it sets height to d2, and is a line which connected with the minimum distance the point A shown in drawing 5 , and Point B in the predetermined circumference direction. In addition, Point A is a point of the arbitration which exists on the periphery circle of the top face S1 of Cylinder S, and Point B is a point which exists in the location of the arbitration on the periphery circle of a base S2.

[0026] A straight line C2 is a line which connected the point E shown in drawing 5 , and Point A, and those of the die length is the same as that of a helix C1. In addition, Point E is a point which exists on the same flat surface Q as the base S2 of Cylinder S, and is a point on the tangent G (tangent of the periphery circle of a base S2) which passes along the point F of being located under the vertical of Point A.

[0027] The involute curve C3 is a curve which exists on the same flat surface Q as the base S2 of Cylinder S, and is a line which connected Point E and Point B according to the fixed principle. Here, if how to draw this involute curve C3 is explained, the yarn H of the same die length as a helix C1 will be prepared first, and it will arrange on a helix C1. And as shown in drawing 6 , Yarn H is released from Cylinder S sequentially from Point B side. The part released from Cylinder S always performs release of this yarn H by [as becoming a straight line] as a tangent of Cylinder S so that the endpoint H1 by the side of Point

B may always move in a flat-surface Q top.

[0028] Thus, when Yarn H is released from Point B until an endpoint H1 intersects Tangent G, the locus (curve) drawn by the endpoint H1 on a flat surface Q is this involute curve C3. And in the process of this release, the curved surface which Yarn H drew on space continuously is a "tangent surface."

[0029] In this operation gestalt, the curved surface 10 which constitutes the 1st blade 5 and 2nd blade 6, respectively is constituted so that a "tangent surface" which was explained above may be formed. In addition, the spiral edge 7 of the 1st and 2nd blades 5 and 6 shown in drawing 3 and drawing 4 is equivalent to the helix C1 shown in drawing 5 , and carries out considerable [of the 1st and 2nd edges 9 for openings and edges 8 for junction of blades 5 and 6] to the straight line C2 and the involute curve C3 of drawing 5 similarly, respectively.

[0030] The wind mill 1 in this operation gestalt has the following advantages compared with the conventional slowdown NIUSU mold wind mill the place which is a thing concerning the above configurations. First, the 1st advantage is being able to manufacture more easily than the plate-like ingredient of one sheet, without using a "mold" for the wing 2 which presents a rational curved-surface configuration. And since the tooth-back section side of a wing 2 is carrying out the wedge, the 2nd advantage is being able to decrease effectively the reaction which should act on a wing 2 in the condition of having turned the tooth-back section side to the direction of the windward.

[0031] Here, in order to explain these advantages more concretely, the example of the manufacture approach of the wind mill 1 in this operation gestalt is described. First, the magnitude of the wing 2 which it is going to manufacture, and a configuration are determined. The 2nd blade 6 of the configuration which ****ed this the 1st blade 5 and on the basis of the level surface as the wing 2 was mentioned above, It is formed by joining each edge 8 for junction, and eight comrades, and the 1st blade 5 and 2nd blade 6 are constituted by the curved surface 10 which makes the spiral edge 7, the edge 8 for junction, and the edge 9 for openings a perimeter [outside] line, respectively.

[0032] therefore, the spiral edge 7 of the 1st blade 5 (or the 2nd blade 6) which showed the magnitude and the configuration of a wing 2 to drawing

3 and drawing 4 and the edge 8 for junction -- and It can determine by defining base elements, such as an include angle (2theta) of the interior angle in a part for the joint of the edges 9 and 9 for openings of each linear dimension of the edge 9 for openings, the 1st blade 5, and the 2nd blade 6, and a radius (Y) of the spiral of the spiral edge 7. In addition, "a spiral radius" here means the radius Y of the radii line which the spiral edge 7 draws in drawing 4 which said the radius of the circle made by projecting a spiral on the level surface, for example, showed the top view of a wing 2.

[0033] Although these base elements can be set to arbitration with the magnitude of the wind mill which a manufacturer wishes to have with a natural thing, and a configuration, they are set as "70 degrees" among those base elements in this operation gestalt about "the include angle (2theta) of the interior angle in a part for the joint of the edges 9 and 9 for openings" so that rotational energy may be most efficiently obtained by revolution of a wind mill. That reason is that it is theoretically thought that the torque acquired by revolution of a wind mill becomes max when this include angle is set as 70 degrees (accuracy 70.528 degrees (**5 degrees)). Hereafter, the antecedent basis on the theory which should set this include angle as 70 degrees is explained.

[0034] first, with the uniform amount of the wind which the wing 2 of a wind mill 1 receives in opening 4 For example, the amount of the wind received in the location near the edge 8 for junction among the flat surfaces (flat surface of the isosceles triangle formed by some of two edges 9 and 9 for openings, and revolving shafts 3) which form opening 4, If it assumes that the amount of the wind received in the location near a revolving shaft 3 is the same and the include angle of an interior angle [in / for the die length of the edge 9 for openings / a part for the joint of "1" and the edges 9 and 9 for openings] is set to "2theta", the following "formula 1" can express the area "A" of opening 4.

[0035]

[Equation 1]

$$A = \int_0^{l\cos\theta} 2\sin\theta \frac{l\cos\theta - x}{\cos\theta} dx = l^2 \cos\theta \sin\theta$$

[0036] Next, the primary moment of the flat surface which forms this opening 4 is calculated, and that torque "M" is searched for by the degree

type.

[0037]

[Equation 2]

$$M = \int_{n}^{l\cos\theta} 2\sin\theta \frac{l\cos\theta - x}{\cos\theta} x dx = \frac{1}{3} l^3 \cos^2\theta \sin\theta$$

[0038] And if the above "a formula 2" is differentiated by "theta" and limit value is calculated, it will become as follows.

[0039]

[Equation 3]

$$\frac{dM}{d\theta} = -\frac{2}{3} l^3 \cos\theta \sin^2\theta + \frac{1}{3} l^3 \cos^3\theta$$

[0040]

[Equation 4]

$-\frac{2}{3} l^3 \cos\theta \sin^2\theta + \frac{1}{3} l^3 \cos^3\theta = 0$ を解いて

$\theta = \tan^{-1}(\frac{1}{\sqrt{2}}), -\tan^{-1}(\frac{1}{\sqrt{2}}), \frac{\pi}{2}$ を得る

[0041] Thus, since the value of "theta" must be larger than 0 and it must be smaller than pi/2 among the acquired solutions, the first solution is adopted. And if the approximate value is calculated, it will become as a degree type.

[0042]

[Equation 5]

$$\tan^{-1}(\frac{1}{\sqrt{2}}) \times \frac{180}{\pi} = 35.264度$$

[0043] When "theta" is set up with 35.264 degrees as the above "a formula 5", it is thought that the torque of a wind mill 1 becomes max (namely, when the include angle "2theta" of the interior angle in a part for the joint of the edges 9 and 9 for openings is set up with 70.528 degrees).

[0044] In this operation gestalt, the include angle (2theta) of the interior angle in a part for the joint of the edges 9 and 9 for openings is set as 70 degrees (**5 degrees) based on such a theoretical antecedent

basis. And if the design of a wing 2 is completed by setting up the dimension of other base elements besides setting out of the include angle of this interior angle next, based on that design value, the 1st blade 5 which constitutes a wing 2, and the 2nd blade 6 will be manufactured.

[0045] By the way, the "tangent surface" which constitutes the 1st blade 5 concerning this operation gestalt and the 2nd blade 6 is known as data that it was proved mathematically that it is the "applicable surface." This "applicable surface" means the curved surface which can be developed at a flat surface, and when it considers conversely that a "tangent surface" is the "applicable surface", it will be said that a "tangent surface" can be easily formed by incurvating a monotonous ingredient.

[0046] And since it is constituted so that a curved surface 10 may form a "tangent surface", the 1st blade 5 which starts this operation gestalt as above-mentioned, and the 2nd blade 6 can only incurvate the plate-like ingredient of one sheet cut out in the predetermined configuration, and can be formed easily, without needing a "mold."

[0047] Since it is such, the wind mill 1 in this operation gestalt Judge a monotonous wooden plate and it is made to curve by attaching these in the position on the peripheral face of a revolving shaft 3. Consequently, it comes to form two or more wings 2 by forming the 1st blade 5 constituted by the tangent surface and the 2nd blade 6 on the peripheral face of a revolving shaft 3, and joining these in the edges 8 and 8 for junction.

[0048] Drawing showing the condition of having specifically developed first the 1st blade 5 which it is going to manufacture at the flat surface is drawn, and a monotonous wooden plate is judged according to this drawing. next, the judged wooden plate -- the position on the peripheral face of a revolving shaft 3 -- attaching . In case wooden plate 5a is attached in a revolving shaft 3, as shown in drawing 7 , based on a design value, the installation target position X of a wooden plate is beforehand specified on the peripheral face of a revolving shaft 3, and radii up 7of wooden plate 5a a is attached along this target position X, it fixes, and this forms the 1st blade 5 on a revolving shaft 3. If the display of a target position X is as a design at this time, wooden plate 5a will be attached on a revolving shaft 3 in the condition of having curved, and that bow curved surface must be a "tangent surface."

[0049] Thus, if the 1st blade 5 which presents a tangent surface is formed on a revolving shaft 3, according to the same procedure as this, the 2nd blade 6 will be formed under the 1st blade 5. And if each edge 8 and 8 for junction is joined, the wind mill 1 with which two or more formation of the wing 2 as shown in drawing 1 was carried out at the circumference of a revolving shaft 3 can be manufactured easily.

[0050] In addition, installation of a up to [the revolving shaft 3 of wooden plate 5a] must not necessarily fix the whole circular section 7a to up to a revolving shaft 3, for example, you may make it not necessarily fix only the both ends 30 and 31 (to refer to drawing 7) of circular section 7a to up to a revolving shaft 3. Moreover, although you may carry out after attaching a wooden plate in a revolving shaft 3 as mentioned above, junction of the edge 8 for junction of the 1st blade 5 and the 2nd blade 6 and eight comrades joins a part of wooden plates of two sheets which should form the 1st blade 5 and 2nd blade 6, and it is after that and you may make it attach them in up to a revolving shaft 3.

[0051] Moreover, although formed of the monotonous wooden plate as above-mentioned, the 1st blade 5 in this operation gestalt and the 2nd blade 6 can also be formed using the plate made from plastics, or a metal plate, for example, if it is an easy flexible material to have sufficient reinforcement which can secure the function as a wing of a wind mill, and to deform into a curved surface.

[0052] Furthermore, in this operation gestalt, although three wings 2 are attached in the circumference of a revolving shaft 3, you may constitute so that the wing 2 of the number four or beyond it may be attached. Moreover, in opening 4, a carrier beam wind can pass along the inside of a wing 2 and a revolving shaft 3, it can constitute so that it may escape to an opposite hand, and it can also make a wind the structure (the so-called "cross-flow type" of structure) where a thrust is also given to wings 2 other than carrier beam wing 2.

[0053] Moreover, in this operation gestalt, although the wing 2 is attached in the revolving shaft 3 by fixing the spiral edge 7 directly on the peripheral face of a revolving shaft 3, the spiral edge 7 may constitute so that it may be indirectly attached in a revolving shaft 3 through a fixture etc. In this case, the peripheral face of a revolving

shaft 3 may be formed of the curved surface which is not necessarily in agreement with the curvature of the spiral edge 7.

[0054] As explained above, the wind mill in this operation gestalt has the wing which presents an ideal curved-surface configuration in consideration of air resistance etc., and it can manufacture it faithfully and easily to a design value, without using a "mold" for the wing of such a delicate curved-surface configuration. Therefore, in being able to simplify a production process, it can respond flexibly also to the design change of a wind mill etc. Moreover, it is possible to gather effectiveness without the complicated additional equipment. Moreover, also under a strong wind, a wind can be missed and it can operate safely.

[0055] Next, the wind mill concerning the 2nd operation gestalt of this invention is explained. The wind mill in this operation gestalt is characterized by using cloth material as an ingredient which constitutes a wing. Drawing 8 shows the wind mill 31 concerning this operation gestalt, and this wind mill 31 is fundamentally constituted by three wings 32a, 32b, and 32c, revolving shafts 33, and three fasteners 40a, 40b, and 40c.

[0056] the wind mill [in / in three wings 32a-32c / the 1st operation gestalt] 1 -- the same -- the circumference of a revolving shaft 33 -- all -- the same direction -- and each keeps equal spacing and is arranged. And this wind mill 31 will rotate in the specific direction (the direction of R in drawing 8), if the wind from a certain direction is received.

[0057] Wings 32a-32c are constituted by the 1st blade 35 and the 2nd blade 36, respectively. The 1st blade 35 and 2nd blade 36 serve as a configuration mutually ****ed on the basis of the level surface like the 1st operation gestalt, and are constituted by the tangent surface where all make the spiral edge 7, the edge 8 for junction, and the edge 9 for openings a perimeter [outside] line.

[0058] Fasteners 40a-40c are constituted by the metal with few deflections (or well-known ingredient equivalent to it) which has reinforcement sufficient as a member which fixes the wing 32 of a wind mill 31. And in this operation gestalt, these fasteners 40a-40c serve as a configuration which has three top-most vertices, and have structure

which can fix Wings 32a-32c at each top-most vertices as illustrated.

[0059] If it explains more concretely, fastener 40a and fastener 40c fix each upper bed section and soffit section of Wings 32a-32c to a revolving shaft 33, and fastener 40b has composition which fixes the end of the edge 8 for junction of Wings 32a-32c to a revolving shaft 33.

[0060] Although the 1st blade 35 and 2nd blade 36 in this operation gestalt are constituted by cloth material, they have the structure where the special three-dimensional configuration of a tangent surface can be maintained, by constituting the periphery enclosure (the spiral edge 7, the edge 8 for junction, and edge 9 for openings) with a frame and a wire. Below, the structure is explained concretely.

[0061] In addition, as cloth material used in this operation gestalt, although a natural fiber, a synthetic fiber, a nonwoven fabric, a plastic film (or sheet), etc. can be used, permeability is low and it is desirable to use cloth material with the sufficient reinforcement and the endurance which can secure the function as a wing 32 of a wind mill. Since especially a wind mill is used outdoors, it is desirable to use the raw material excellent in the weatherability of the tentorium ground, sail cloth, etc., and it is still more desirable to perform fluorine processing to the front face of the cloth to be used so that higher weatherability can be obtained.

[0062] Drawing 9 combines the structure of the 1st blade 35 with the structure of a revolving shaft 33 and fastener 40 grade, and shows it to a detail. In this drawing, a direct-like frame for 41 to fix the 1st blade 35 in the edge 9 for openings and 42 are the involute frames for fixing the 1st blade 35 in the edge 8 for junction. In addition, these direct-like frames 41 and the involute frame 42 are constituted by the metal with few deflections (or well-known ingredient equivalent to it) which has reinforcement sufficient as a member which constitutes the wing of a wind mill. Moreover, 43 is a wire for fixing the 1st blade 35 in the spiral edge 7.

[0063] In the overall length of the spiral edge 7 and the edge 9 for openings, **** is prepared in the 1st blade 35, and each **** has structure which can let a wire 43 and the direct-like frame 41 pass in the ****.

[0064] Since the involute frame 42 fixes the 1st blade 35 in the edge

8 for junction, it is carrying out the configuration adapted to the edge 8 for junction. In addition, in drawing 9 , 42a is the point of the involute frame 42, and 42b is the end face section. The involute frame 42 is attached in fastener 40b in end face section 42b as illustrated.

[0065] Moreover, the direct-like frame 41 is carrying out the shape of linear, and it passes along the inside of **** prepared in the edge 9 for openings, and one edge is attached in fastener 40a, and another edge is attached in edge 42a of the involute frame 42.

[0066] A wire 43 passes along the inside of **** prepared in the spiral edge 7, one edge is attached in fastener 40a, and another edge is attached in end face section 42b of the involute frame 42. Since the wire 43 is constituted by the flexible metal (or well-known ingredient equivalent to it) which has reinforcement sufficient as a member which constitutes the wing of a wind mill, it is based on the configuration of the spiral edge 7 of the 1st blade 35, curves, and is held between fastener 40a and 40b in the condition.

[0067] As explained above, the 1st blade 35 of the wind mill 31 in this operation gestalt The wire 43 with which the cloth material judged by the predetermined configuration was held between fastener 40a and 40b, By being stretched and passed by the direct-like frame 41 and the involute frame 42 by which the end was fixed to Fasteners 40a and 40b, respectively, the circumference of a revolving shaft 33 is fixed and it has the composition that the special three-dimensional configuration of a tangent surface can be maintained.

[0068] And Wings 32a-32c are formed in the circumference of a revolving shaft 33 of the 1st blade 35 and the 2nd blade 36 concerning the almost same structure as this, and the wind mill 31 in this operation gestalt can expect the same effectiveness as the wind mill 1 of the 1st operation gestalt according to this structure, as shown in drawing 8 .

[0069] Furthermore, according to this operation gestalt, after forming the three-dimensional configuration of a wing beforehand since the special three-dimensional configuration of a tangent surface will be formed inevitably in case cloth material is attached in a revolving shaft 33, it is not necessary to attach in a revolving shaft 33, and simplification of a manufacture process can be attained. Moreover, the cloth material used as an ingredient of the blade which constitutes a

wing 32 is light, and it excels in formation workability, and in case a large-sized wing is manufactured from acquisition of a large ingredient being easy, it is suitable, and dealing with enlargement of a wind mill is possible.

[0070]

[Effect of the Invention] According to this invention, it is possible to manufacture the wing of the wind mill which is a rational solid configuration from plane ingredients, such as a plywood which is marketed, a plastic sheet, and plywood, without needing a "mold." Therefore, the effectiveness that a wind mill can be manufactured cheaply and easily is expectable.

[0071] Moreover, since it is the wind mill of a reaction mold, it has advantages, such as rotationality under a breeze, high torque in a low-speed revolution region, and the simplicity of structure, and it is possible to use it also in a developing country and the weak area of a wind. Moreover, at the time of a revolution, it has high silence and can also be used also in people's accommodation space.

[0072] Furthermore, it is possible to lightweight-ize a wing and to aim at improvement in the revolution effectiveness of a wind mill by using cloth, as a raw material of the wing of a wind mill. Moreover, since deformation processing to the curved surface at the time of manufacturing a wing is not needed unlike other ingredients, a wing can be manufactured easily. Moreover, if it is cloth, since the raw material of large size will also be easy to come to hand and there will be no need for curved-surface processing, it is useful to especially the wind mill of large size.

[Brief Description of the Drawings]

[Drawing 1] The perspective view of the wind mill 1 in the 1st operation gestalt of this invention.

[Drawing 2] The top view of the wind mill 1 of drawing 1 .

[Drawing 3] The perspective view of the wing 2 of the wind mill 1 of drawing 1 .

[Drawing 4] The top view of the wing 2 of drawing 3 .

[Drawing 5] The explanatory view of the "tangent surface" defined on geometry.

[Drawing 6] The explanatory view of the "tangent surface" defined on

geometry.

[Drawing 7] The explanatory view of the manufacture approach of the wind mill 1 of drawing 1 .

[Drawing 8] The perspective view of the wind mill 31 in the 2nd operation gestalt of this invention.

[Drawing 9] Structural drawing of the wind mill 31 of drawing 8 .

[Drawing 10] The perspective view of the conventional propeller mold wind mill 100.

[Drawing 11] The perspective view of the conventional slowdown NIUSU mold wind mill 200.

[Description of Notations]

1: Wind mill,

2a, 2b, 2c: Wing,

3: Revolving shaft,

4: Opening,

5: The 1st blade,

6: The 2nd blade,

7: Spiral edge,

8: The edge for junction,

9: The edge for openings,

10: Curved surface,

30 31: Edge,

32a, 32b, 32c: Wing,

33: Revolving shaft,

35: The 1st blade,

36: The 2nd blade,

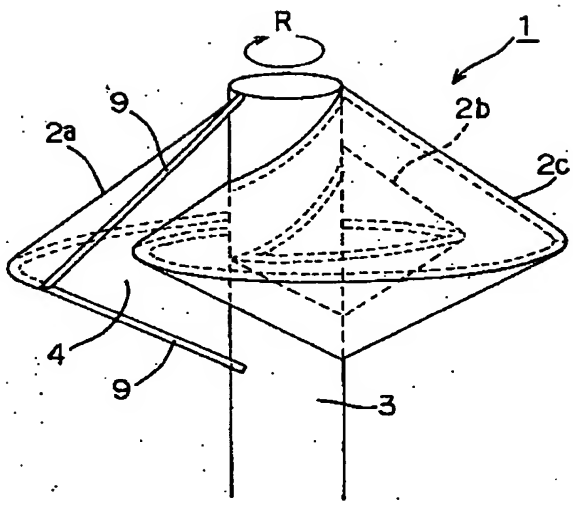
40a, 40b, 40c: Fastener,

41: Direct-like frame,

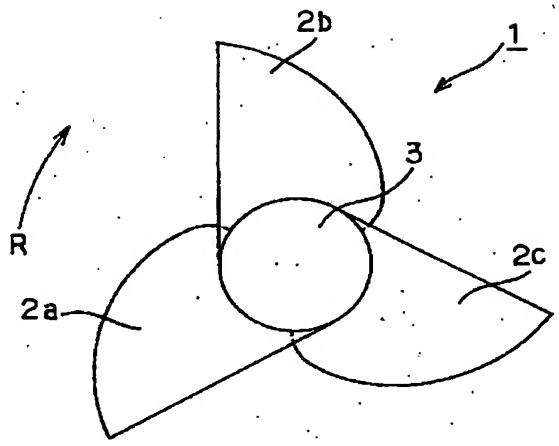
42: Involute frame,

43: Wire,

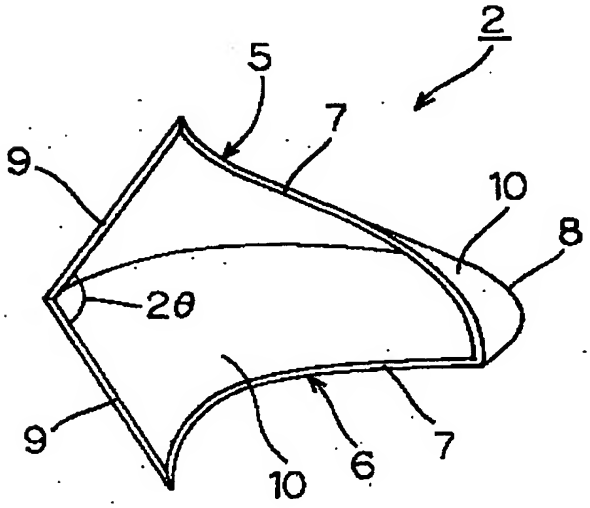
Drawing 1



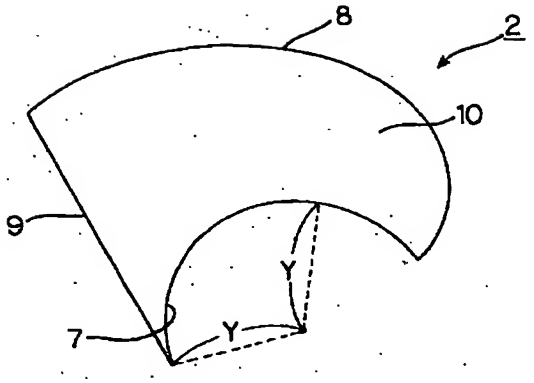
Drawing 2



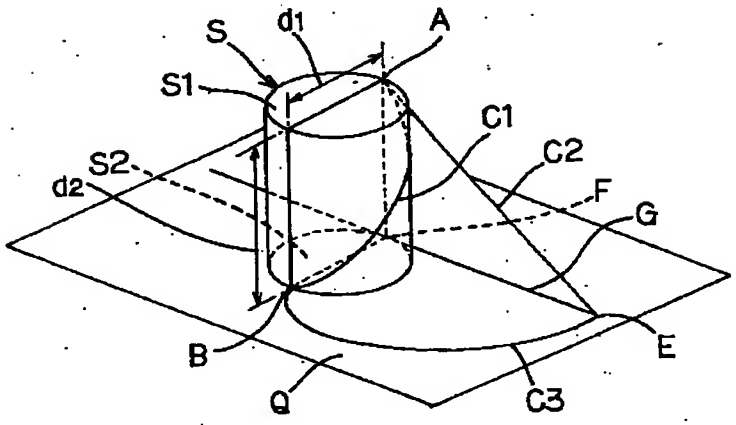
Drawing 3



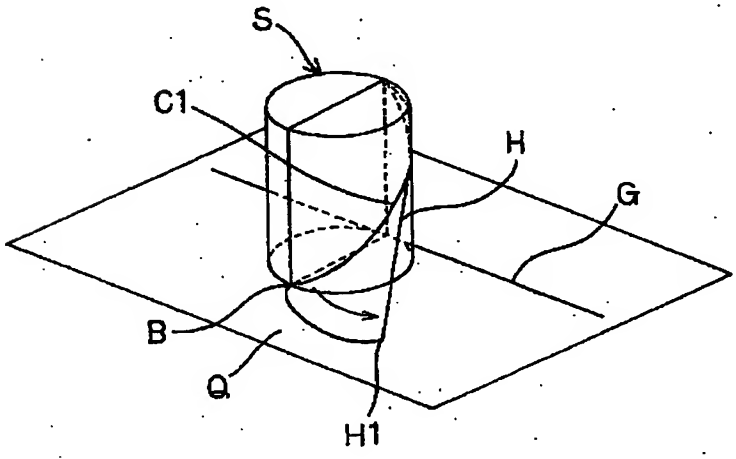
Drawing. 4



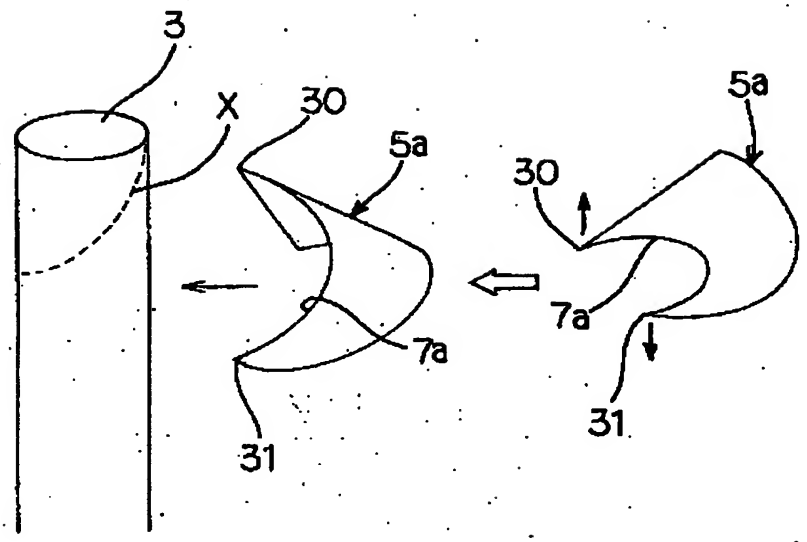
Drawing. 5



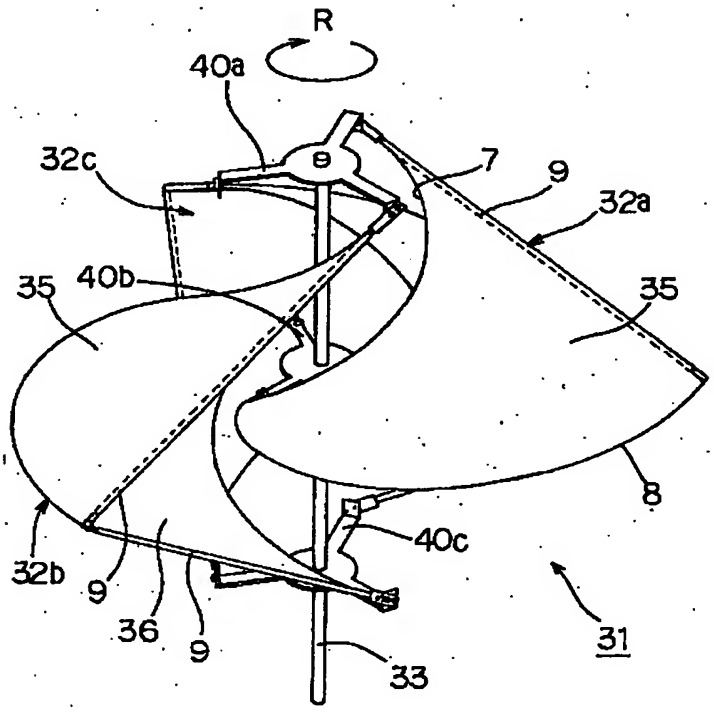
Drawing 6



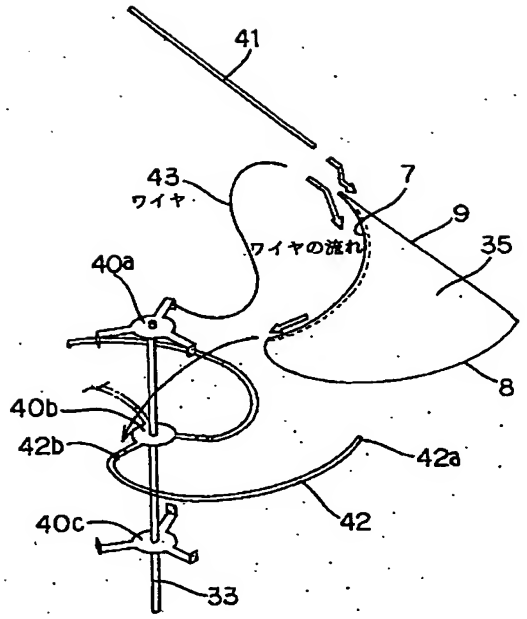
Drawing 7



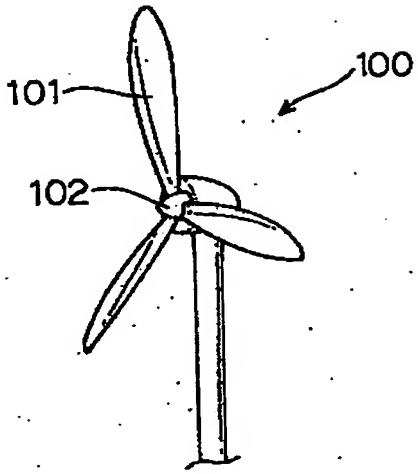
Drawing 8



Drawing 9



Drawing 10



Drawing 11